



**UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office**

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/473,988	12/29/99	INOUE	T 991493

ARMSTRONG WESTERMAN HATTORI
MCLELAND & NAUGHTON
1725 K STREET NW
SUITE 1000
WASHINGTON DC 20006

MM92/0906

EXAMINER

DOAN, T

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 09/06/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/473,988

Applicant(s)

INOUE ET AL.

Examiner

THERESA T DOAN

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

- 1) ☒ Responsive to communication(s) filed on 18 July 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 11-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☒ All b) ☐ Some * c) ☐ None of the CERTIFIED copies of the priority documents have been:
1. ☒ received.
 2. ☐ received in Application No. (Series Code / Serial Number) _____.
 3. ☐ received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 18) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-10, drawn to a semiconductor device, classified in class 257, subclass 758.
- II. Claims 11-19, drawn to a process of making a semiconductor device, classified in class 438, subclass 761.

The inventions are distinct, each from the other because of the following reasons: Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another and materially different process such as one in which rather than depositing the insulating layer containing SiH and curing, sputtering is employed to incorporate SiH.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Stephen G. Adrian on 08/24/2000 a provisional election was made with traverse to prosecute the invention of group I, claims 1-10. Affirmation of this election must be made by applicant in replying to this Office

action. Claims 11-19 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is advised that the reply to this requirement to be complete must include an election of the invention to be examined even though the requirement be traversed (37 CFR 1.143).

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a petition under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 2, 4, 7 and 9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 2, 4, 7 and 9 recite the limitation "degassing amount". What does it mean? Do you mean SiH is around 50% as shown on page 18 line 20? Correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

Art Unit: 2814

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

4. Claims 1-3 and 9-10 are rejected under 35 U.S.C. 102 (e) as being anticipated by Shields (U.S. Pat. 5,958,798).

With respect to claims 1 and 10, Shields discloses in figure 5 a semiconductor device comprising:

an insulating interlayer 52 formed on a conductive film 59 and including an insulating layer of a composition containing SiH,

and shows a HSQ layer with 70% - 90% SiH bonds which is equivalent to an H content of not less than 15.4 atom % in the composition (column 4, lines 60-61).

With respect to claims 2 and 9 in so far as they are understood, Shields discloses an insulating interlayer 52 formed on a conductive film 59 and including an insulating layer of a composition containing SiH, and insulating layer has an SiH content of 70%-90%.

With respect to claim 3, Shields discloses a contact hole for exposing part of a surface of conductive film is formed, and an interconnection layer electrically connected to the conductive film through the contact hole and the contact hole has a moderately tapered upper wall surface.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 4-5 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shields (U.S. Pat. 5,958,798) in view of Brennan (U.S. Pat. 5,998,297).

With respect to claims 4-5, Shields teaches an insulating interlayer 52 formed on a conductive film 59 and including an insulating layer of a composition containing SiH, and shows a HSQ layer with 70% - 90% SiH bonds which is equivalent to an H content of not less than 15.4 atom % in the composition (column 4, lines 60-61).

Shields does not teach a semiconductor element is provided on a semiconductor substrate, and the conductive film is formed over the semiconductor element and electrically connected to the semiconductor element. However, Brennan teaches the semiconductor element 12 is provided on a semiconductor substrate 10, and the conductive film is formed over the semiconductor element and electrically connected to the semiconductor element (see figure 1c). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to apply the shields technique to the Brennan to obtain the superior capability of the HSQ structure.

7. Claims 7-8 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shields (U.S. Pat. 5,958,798) in view of Wollesen (U.S. Pat. 5,900,668).

With respect to claim 7, in so far it is understood and 8, Shields shows a basic interconnect structure. Shields does not teach a semiconductor element formed on a semiconductor substrate, and a multilayered interconnection structure formed over semiconductor element and electrically connected to the semiconductor element,

wherein the multilayered interconnection structure is an interconnection structure of at least two layers in which a conductive film or a lower interconnection layer and an upper interconnection layer formed on an insulating interlayer are electrically connected through a contact hole formed in the insulating interlayer. However, Wollesen teaches a semiconductor element 6 formed on a semiconductor substrate 1, and a multilayered interconnection structure formed over semiconductor element 6 and electrically connected to the semiconductor element, wherein the multilayered interconnection structure is an interconnection structure of at least two layers in which a conductive film or a lower interconnection layer 10 and an upper interconnection layer 13 formed on an insulating interlayer 7 are electrically connected through a contact hole 9 formed in the insulating interlayer (see figure 2). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to apply the shields technique to the Brennan to obtain the superior capability of the HSQ structure.

8. Claim 6 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Shields (U.S. Pat. 5,958,798) in view of Brennan (U.S. Pat. 5,998,297) and further in view of Yu (U.S. Pat. 6,069,383).

With respect to claim 6, as discussed above, the combination of Shields and Brennan show the basic structure. Yu further shows the semiconductor element comprises a memory cell having a floating gate 33 formed on a tunnel insulating film 32 on the semiconductor substrate 31, a control gate 35, and a source 39a and a drain 39b formed in surface regions of the semiconductor substrate (see figure 3B). It would have

been obvious to one having ordinary skill in the art to apply the interconnect technique to a memory cell.

Conclusion


The prior art documents submitted by applicant in the Information Disclosure Statement filed on December 29, 1999 have all been considered and made of record (note the attached copy of form PTO-1449).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Theresa T. Doan whose telephone number is (703)305-2366. The examiner can normally be reached on 8:00-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, OLIK CHAUDHURI can be reached on (703) 308-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

TD
Theresa Doan
August 28, 2000


OLIK CHAUDHURI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800